Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences
# Graduation Plan: All tracks

The graduation plan consists of at least the following data/segments:

## Personal information

<table>
<thead>
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</thead>
<tbody>
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</tbody>
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## Studio

<table>
<thead>
<tr>
<th>Name / Theme</th>
<th>Urbanism - Delta Interventions</th>
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<tr>
<td>Teachers / tutors</td>
<td>First mentor: V.J. Meyer (Urbanism)</td>
</tr>
<tr>
<td></td>
<td>Second mentor: J.R.T. van der Velde (Landscape Architecture)</td>
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### Argumentation of choice of the studio

The research is an explorative design towards combining water safety adaptivity and adaptivity to urban developments. In the final design the goal is to find a link between the requirements that urban adaptation present and the requirements that climate change related adaptation present. The input given from both smaller and larger scale should be combined into an integral design.

Having aspects of water and urban development this problematic is mostly relevant in designing for locations in deltas. This makes the delta interventions studio the most fitting studio in the programme.

## Graduation project

<table>
<thead>
<tr>
<th>Title of the graduation project</th>
<th>The Adaptive Landscape</th>
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### Goal

<table>
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<th>Location:</th>
<th>Dordrecht</th>
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<td>The posed problem,</td>
<td>Designing with multiple uncertainties, climate change related and urban development related.</td>
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<tr>
<td>research questions and</td>
<td>What does a plan look like that can accommodate different water dynamics as well as different urban dynamics?</td>
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<tr>
<td>design assignment in which these result.</td>
<td>Scoping multiple scenarios and addressing these in an adaptive design.</td>
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The Netherlands is one of the leading players in the field of water management. In the past large, then, state of the art projects were realized like the Deltawerken and the Zuiderzeewerken. After a period of time problems present themselves within the system that has been realized. Climate change has such a severe effect on the water system that the flood
defense measures that we have in place now may not suffice in the future.

Planning with climate change is still a difficult task, there is a wide range of possible futures that can become reality. This research will focus on the island of Dordrecht. On this location the water dynamics have multiple contributors. The main contributors are the river system and the sea. The island of Dordrecht is on the edge of the area where the sea’s tide has an effect on the river’s water levels. When sea levels rise the water level and thus the pressure on the flood defenses will increase. On the other hand there is the effect of climate change on the weather where more extreme periods of excessive rain and drought will be more common. These to contributors can result in a variety of scenarios that the area could be subject to making it difficult to design or plan a fitting solution for the new situation.

Besides the uncertainty that the water can bring for planning in an area there are the ‘normal processes’ that are in play in planning for a city. In the case of Dordrecht the city does not know what the future exactly will bring and what the demand will be in developments. Where in the past growth and expansion was a safe guess the city now shows a small shrinkage over the last few years. The prognosis is that the shrinkage will turn into growth again in a relative short amount of time. However what type of development will be needed cannot be pinned at this moment.

Goal
The goal of this research will be to search for the possibilities to create a landscape that can be adaptive to the different possible water problematics that may present itself in the future as well as to create a landscape that is prepared to be fitting to accommodate different types of programme. An integration of these two types of landscapes may be a contribution to the discussion on how adaptive design can work in an area that has to deal with different unknown dynamics.

Besides the division between addressing urban dynamics and climate related dynamics another division can be made between scales. Water safety measures can be applied on a large scale to address general safety, for instance on city level. On a smaller scale, block or residence level, other strategies to address water safety can be applied.

This same principle can also be found in urban adaptivity. On a large scale the general and possible future needs of the city should be addressed while on a smaller scale the effect of the typology on the landscape should be considered. Will the small scale intervention reshape the landscape in such a way that in the future this need to be done again or are there typologies and forms where the same preparations can be used to develop something else.

The main design principle concerning adaptivity will be based on the use of scenarios. Scenarios will present a range of possible outcomes that dynamics with requirements for an area. With the use of these scenarios interventions should be found that can work for different scenarios at some point in time. What interventions work for all scenarios at moment 1 (see image) and do not hinder possible developments, overlapping interventions for moment two are more of explorative nature. In reality this process of searching for fitting
interventions for all scenarios can repeat itself while you get the information of how the area actually developed.

SCOPE

In the final design the goal is to find a link between the requirements that urban adaptation present and the requirements that climate change related adaptation present. The input given from both smaller and larger scale should be combined into an integral design.

Proposed case

Potential locations that are in need for new plans or strategies concerning flood defense measures are abundant. As Meyer and Nijhuis state:

“The Dutch river- and delta landscapes are an important laboratory for experiments of new approaches, which try to take into account the different dynamics of the different layers.” 2014

The case of Dordrecht especially where different water dynamics can be found, tidal and river dynamics is an interesting location.

This research will be done partly in cooperation with the municipality of Dordrecht. Information brought forward by the municipality but also instances as the province and water boards will be used as context for the research.

One of the main contributors for the context is a research done on what the effects will be of compartmentation of the island. What damages will occur when a flood occurs and how much investment these compartmentation will cost. One option was presented as the most promising in the tested models. This was option IRV6. In short the compartmentation is made in such a way that when the weakest part of the main water defense ring will collapse the water will be directed towards the agricultural land on the southern side of the island. This is done by strengthening an old inner dike towards the city side and perforating another one towards the open landscape. By doing this all the water that comes through the most potential breach location will flow through a fairly narrow piece of land between two dikes.
before flowing into the larger open fields. For this research chances of flooding will be set higher than they would be with current plans to support the idea of finding alternative forms and typologies to work with adaptive planning.

This small strip of land is also on the agenda for redevelopment. The location can offer several development options that benefit the adjacent neighborhoods and areas. Several plans had already been made by different instances, however these plans have been rejected due changing demands. At this point in time the municipality does know they want to redevelop the area but does not know what kind of programme to plan here. Considering the location of the area in context to the larger water system and the vague demands from the urban development viewpoint makes this an excellent location to test for a flexible adaptive landscape.

![PROJECT AREA](image)

**Research question**

**Main:**
What does a plan look like that can accommodate different water dynamics as well as different urban dynamics?

**Subquestions**
How did the landscape form around the island of Dordrecht?
How does the history of the area reflect on the current city?
How was water management solved in the past?

What does adaptivity mean for water safety?
What does adaptivity mean for urban development?
The planned methodology divides the research in two different areas. Site specific research and general research on a subject. As connector and overlapping theme the processes and developments are placed. The site specific research should give insight in the history, the form and typology of the landscape and the area. The general research will focus on what the research will try to implement in a design for the location. In this case a flexible adaptive landscape that could accommodate different water safety scenarios as well as different urban developments. This general research should result in an overview of typologies that can deal with the problematics of the adaptive landscape.

The information found in this inventory research will be used to together with different scenarios that were derived from ongoing processes in the landscape and different types of programme to add to different designs. The result of these design can give new ideas or feedback to earlier findings in the initial research.

In the end an attempt will be made to derive a landscape that could work for the different designs. This landscape should be flexible and adaptive to fit the scenarios. Then a reflection will be given to what extent the flexible landscape actually works and if this type of landscape can bring added value to an area.

As a final product a possible fill in of this flexible landscape will be given to test how the landscape will manifest spatially in a design.
This model will not be a continuous process but it will be a circular repeating process where the different steps can run parallel. When the project progresses the first steps will take a less prominent role and make place for the latter steps.

The main techniques used within this model will be executed as followed:

**Literature research** - The literature research will consist of various different media including books, articles, online publications, journals, research reports and previous student graduation work. The main search parameters being Sustainable Flood Defense, Water and urban quality and Dynamic urban water landscape.

**Site visit** - Because the Ijsselmeer area is relatively close there is the luxury of venturing into the chosen project site a few times. Considering the length of the total project this opportunity should be taken advantage of. A first visit will be used for general mapping of impressions and there will be looked at the integration of current water defense structures within the chosen project site. When more questions come forward that ask for returning to the area for more information additional visits can be planned.

**Mapping** - Mapping shall be used as a tool for analyses as well as structuring findings that have been done that have a spatial impact in a plan. This should help organize data and visualize ideas spatially to get a better grasp on the progress of the project and how different findings relate to each other.

**Case studies** - Case studies are important for this research because an inventory of both innovative and robust more traditional projects is desired to compare one’s own findings and get a better indication on how to evaluate them. Within the area of case studies traditional approaches can be found in already developed projects while for innovative projects competition entries might be interesting to analyze. What also is interesting to go back to the basics how people adjusted their living environments to dynamic water levels.
before we had our current modern civil engineering techniques.

‘Design based research’ - The introduction of different dynamics that have to be taken into account brings forward more questions and situations than one can think of at the start of the project. This makes the process as what it is supposed to tackle, dynamic. Design based research will be in the form of a variety of scenarios that should give new input. These designs will be explorative of nature and are a search for different solutions for integrating adaptivity to water with adaptivity to the urban form.

Throughout the research the use of scenarios to explore the location and its possible outcomes will take a central role in the process. The scenarios that will be used to create a range of possible futures are derived from the delta scenarios in the Deltaprogramma 2050 and 2100 (Deltares et al, 2013).

The scenarios are divided along two axis. These axis represent the two variable that will determine the cases in the four different scenarios. The vertical axis represents urban growth (50%) to urban shrinkage (20%) for the region around Dordrecht and its accommodating socio-economic growth or shrinkage and the horizontal axis represents a proposed flood risk for the island of Dordrecht. This model leaves four scenarios where scenario two and three are strongest opposites and scenario one and four are variants between the former two.

Scenario 1: This scenario has a low flood risk combined with an urban growth. In this scenario there is a need for space for expansion as well as a need for densification. The threat of the water will be low but because of the increased densification in case of a flood damages will be high so some measures should be planned.

Scenario 2: This scenario has a high flood risk combined with urban growth. This scenario has the highest demands for available space. Besides the space need for urban expansion and densification as in scenario one extra space has to be reserved for water safety measures. High threats combined with a dense built environment need extensive water safety management. Often sustainable solutions ask for more space than conventional ones, this scenario should explore multifunctional use along densification opportunities.

Scenario 3: This scenario has a low flood risk combined with urban shrinkage. This scenario leaves space for natural dynamics to be reintroduced, space for extensive sustainable solutions.

Scenario 4: This scenario has a high flood risk combined with urban shrinkage. In this scenario one of the design problems is the shrinking city and how to respond to that. The shrinking city however may generate space to manage the high flood risks that this scenario imposes. Sustainable water safety solutions could be integrated with reintroducing the natural environment.
Literature and general practical preference


Atelier GROENBLAUW, 20xx. Meerlaagse veiligheid. Meerlaagse veiligheid vertaald naar ontwerp


Deltares, 2009. Land & water management in the urban environment
Land & water management in the urban environment Deltares. 31(0).

Deltares, Planbureau voor de Leefomgeving, 2011. Deltascenario’s. Verkenning van mogelijke fysieke en sociaaleconomische ontwikkelingen in de 21ste eeuw op basis van KNMI’06 en WLO scenario’s, voor gebruik in het Deltaprogramma 2011 – 2012, Delft


Klee, P. (Ed.), 2013. Adding new value to cities with urban water - Sustainable solutions of integrated urban water management. The Rethink Water network and Danish Water Forum white papers, Copenhagen. Available at www.rethinkwater.dk


Nillesen, A.L., 2013. Improving the Allocation of Flood-Risk Interventions from a Spatial Perspective. JOLA


Case Studies:

Depoldering Noordwaard (Biesbosch)
Flood plain / bypass by lowering certain dike parts
Natural environment

Heijplaat, Het Nieuwe Dorp (Rotterdam City Harbors)
Outerdike multi-level safety project

Proeftuin Vianen
Innerdike multi-level safety project

Hafencity (Hamburg)
Adaptive building, multifunctional flood defense

Ruimte voor de Waal Lent (Nijmegen)
Adaptive water safety design, casco concept example

Kampen
Bypass and popup water defense wall extension
Reflection
Relevance

Scientific relevance
The discussion around adaptive design and water safety is still an ongoing discussion. In this process there is still demand and room for new concepts and ideas on different scales.

Current approaches towards adaptive planning focus on a single type of adaptive design, mostly directed at adaptive to climate change. Where in times of trouble extra space or integrated solutions are given to decrease the pressure on the rest of the flood defense system.

This research will try to go a step further on the idea of adaptive planning or design by adding a second dynamic to the design task where the landscape should not only be adaptive to water dynamics but it should also be able to accommodate the uncertainty of urban development.

The results of this research will hopefully bring forward spatial forms that can be used in a design to work with these different dynamics. However the design will be limited. The hypothesis of a flexible adaptive landscape will be tested in an area that is already planned to be redeveloped and the current landscape is rather empty. In a situation where there already is a lot of built environment the design task of transforming a whole area to an adaptive plan will be much harder.

Societal relevance
In the Netherlands water management is a part of the culture. Since the middle-aged the people that live in the lowlands are searching for different ways to live inside of the watery landscapes in a safe and dry way. Some of the water management development in the 17th century, the Windmills in Kinderdijke, have been recently added to the Unesco World Heritage list. But, concerning water management, around the world the Netherlands most famous for the Deltawerken. Also the Dutch are often asked to participate and share their knowledge concerning water management in new water management related design tasks.

The Netherlands itself is located for 26% under sea level and 59% of the country is vulnerable for flooding and 55% of the country is protected by dikes, dunes and dams. Alongside most of the Dutch population lives in areas that a sensitive to flooding. (PBL, 2014)

Due to climate change and rising sea levels there is a growing demand for sustainable solutions and smart design. Conventional civil water safety infrastructure alone does not make integral solutions of the urban landscape and water management. More value can be gained from proper integration of these elements, where the population as well as the natural environment can benefit from.
In the case of Dordrecht a smart design could serve the public's needs in terms of water safety while also accommodating for different types of urban development making the plan more convenient with less need for rebuilding and redevelopment of areas, saving money and reducing nuisance.

**Time planning**

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<th>Orientation</th>
<th>Literature Research</th>
<th>Case Studies</th>
<th>Design</th>
<th>Site Analysis</th>
<th>Field Trip</th>
<th>Evaluation</th>
<th>Finishing Touch</th>
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